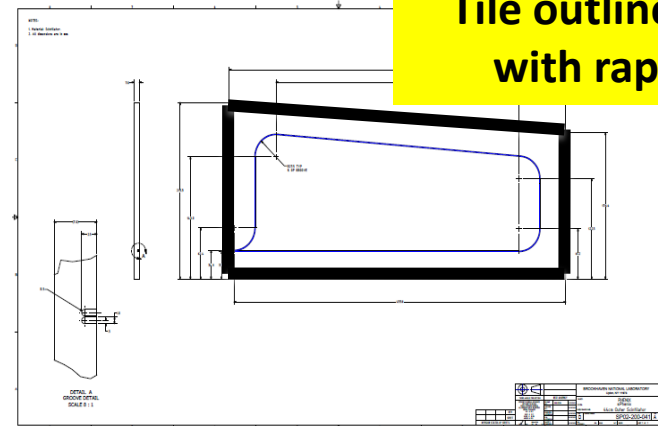
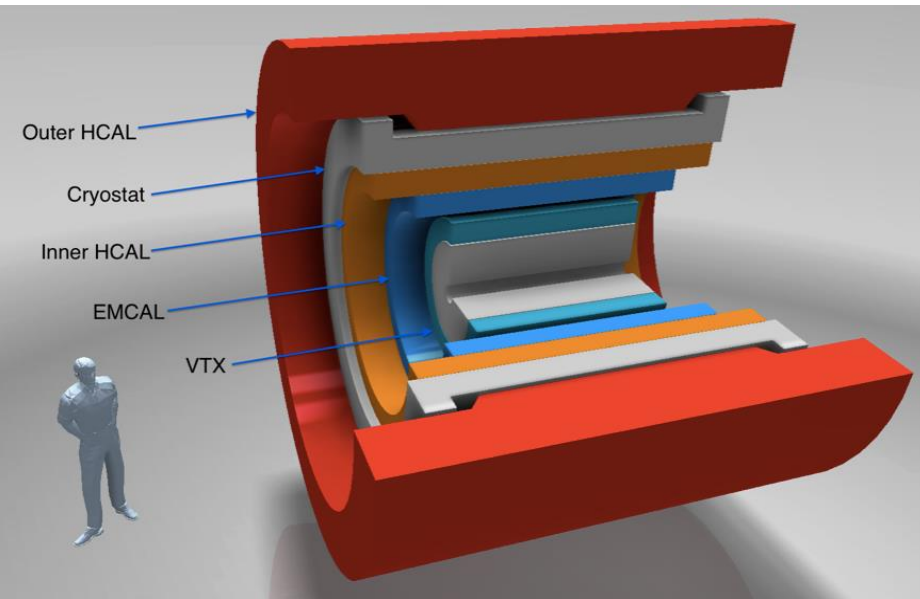


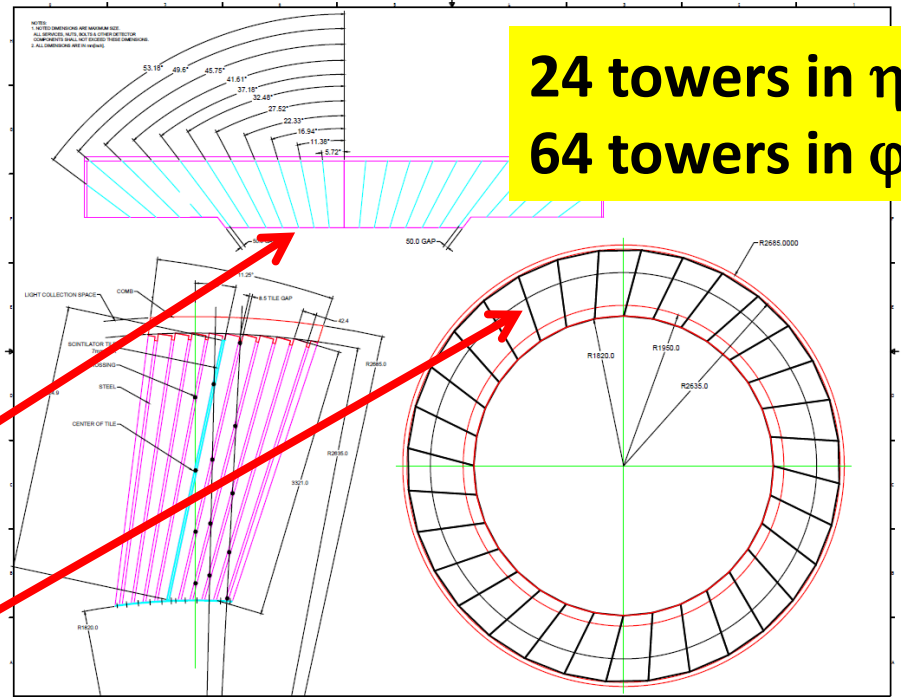
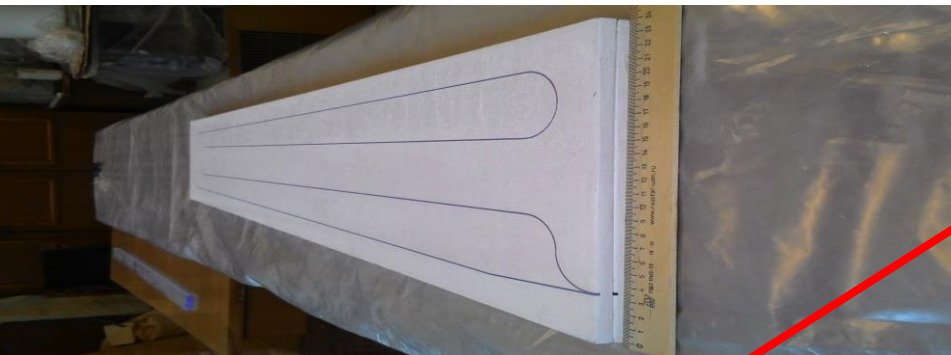
sPHENIX Hcal Development and Status

E.Kistenev, BNL

sPHENIX Hcal: Design 2015



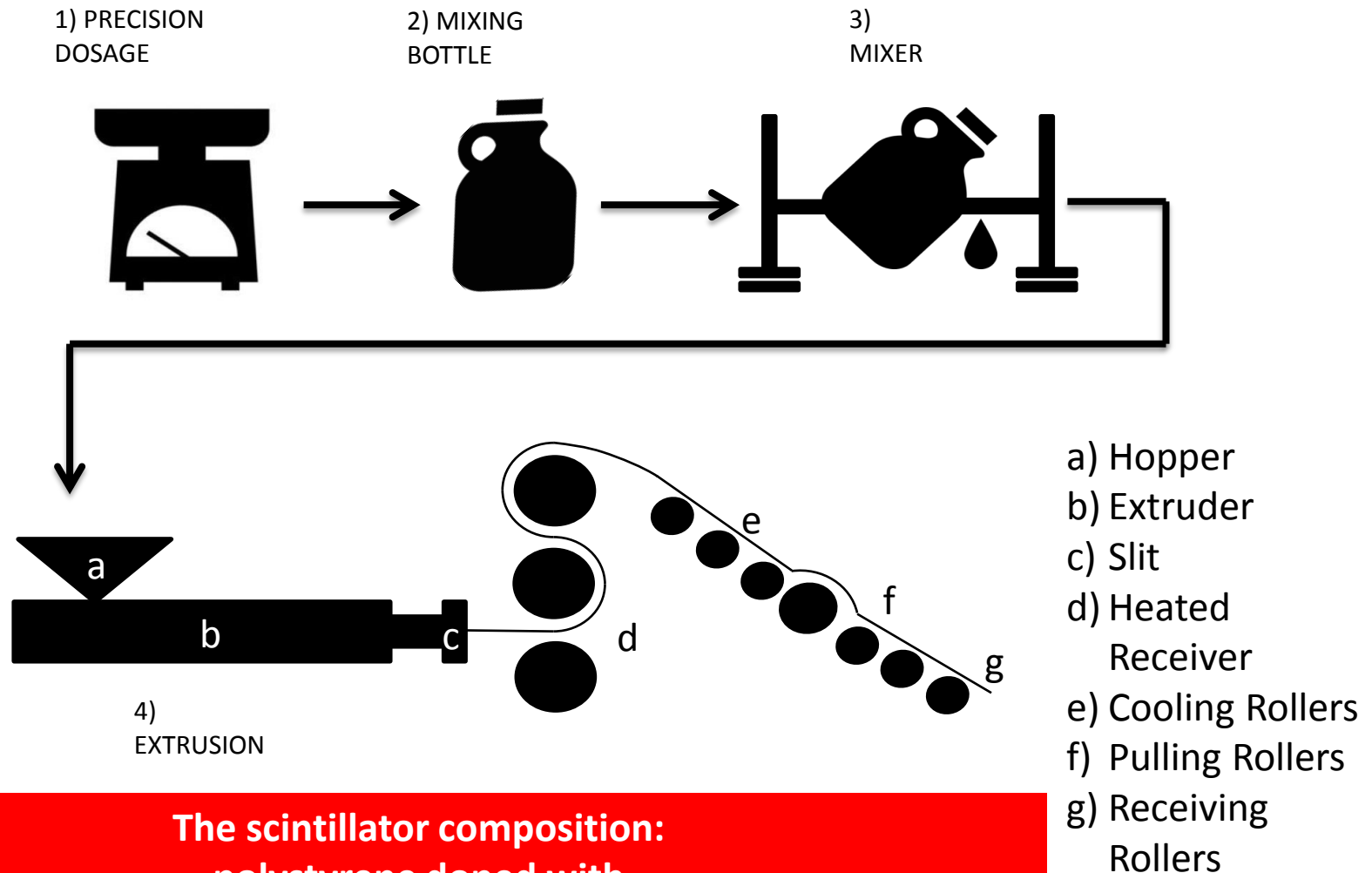
Tile outlines vary with rapidity



**24 towers in η
64 towers in ϕ**

One tower overlap in ϕ (absorber tilt) and η (non "0" pointing)

Large area scintillating tiles for sPHENIX HCal



**The scintillator composition:
polystyrene doped with
1.5% of paraterphenyl (PTP) and 0.01% of POPOP.**

UNIPLAST: QC

Uniplast is currently producing ~10 tonn of 10cm wide scintillating strips for LAr1-ND TPC (FNAL) group at BERN University.

The qualifier is an RGB color sensor as a photon detector and three LED's as light sources to measure light att. length in scintillator.

The outcome was found totally consistent with results of visual inspection of a bunch of stacked tiles with one end exposed to the neon light.

Kingbright

Part Number: KPS-5130PD7C

RGB Color Sensor

KPS-5130PD7C

Description

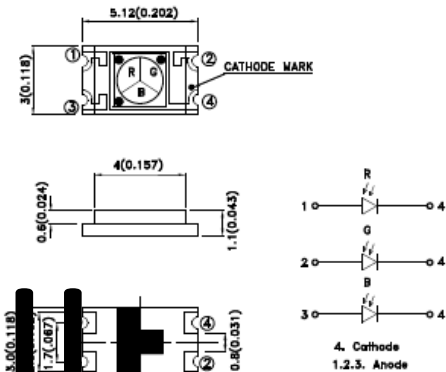
•The KPS-5130PD7C Color Sensor Device, consisting of 3-Channel VMC chip (R, G, B) Si photodiode, is a good effective solution to color balance of display backlighting appliances.

Features

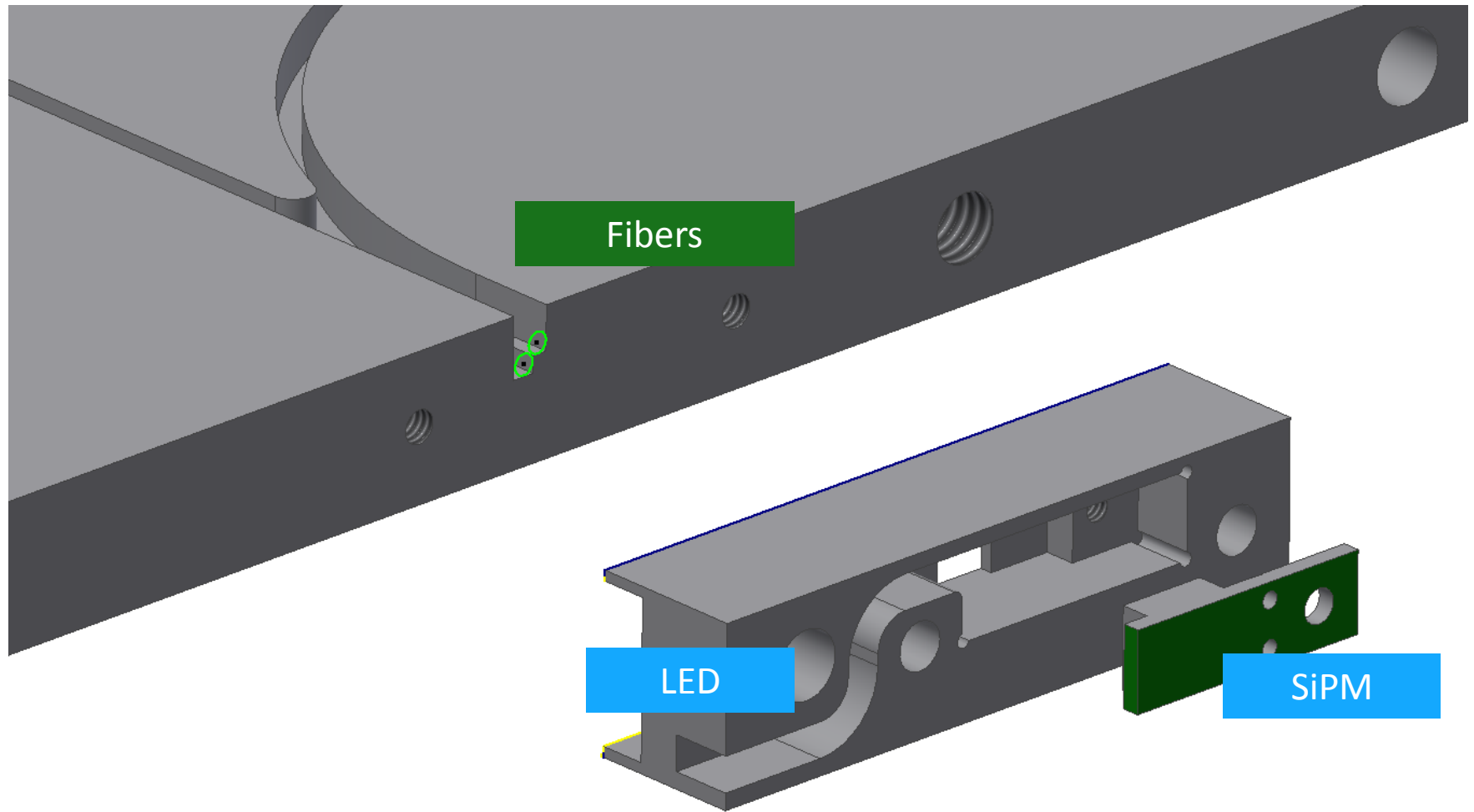
- *Lead-free package.
- *Component in accordance with RoHS.
- *SMD style package on PCB technology.
- *Integral Color Filter in Blue, Green, or Red.
- *Package: 1.5KPCS/Reel.
- *Moisture sensitivity level: level 3.
- *RoHS Compliant

Applications

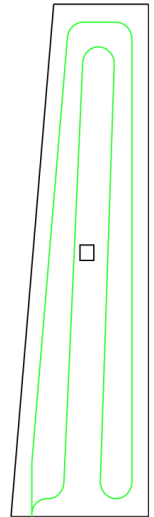
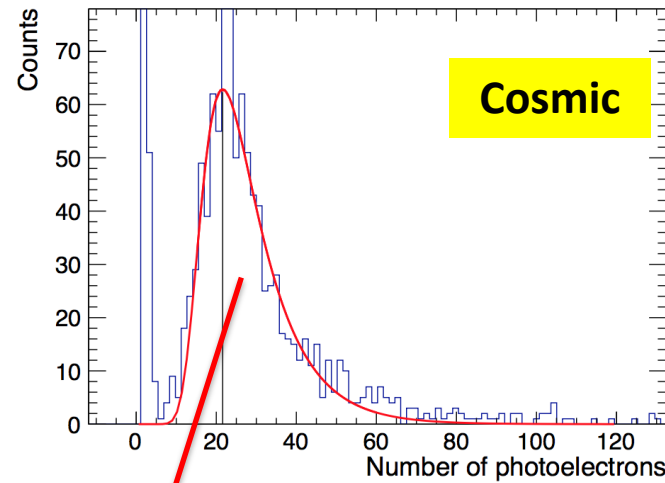
The devices are suitable for:



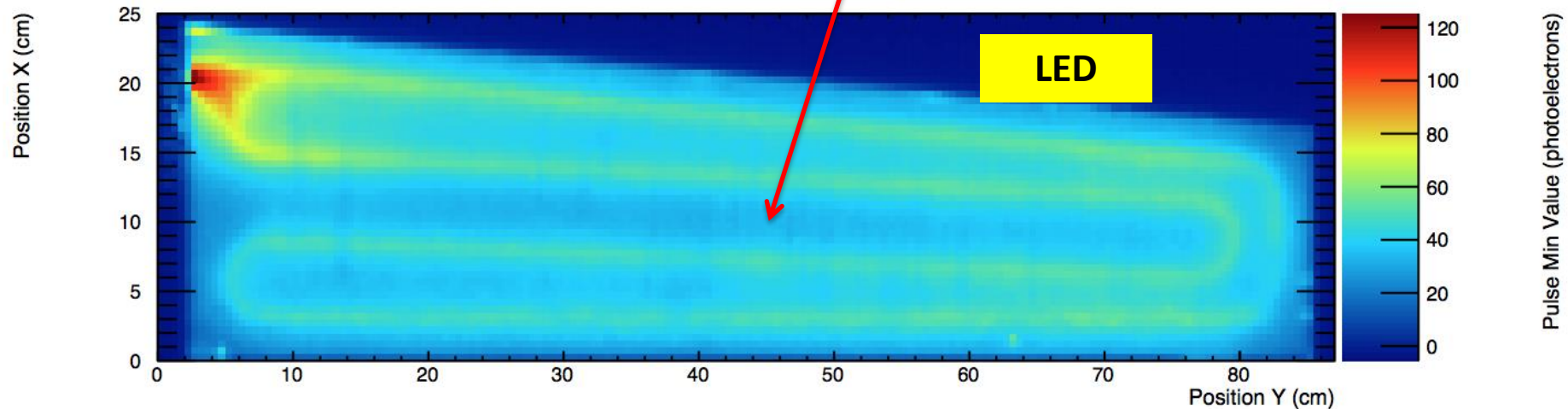
Collecting Light and Monitoring



sPHENIX Hcal Tile Development: Colorado

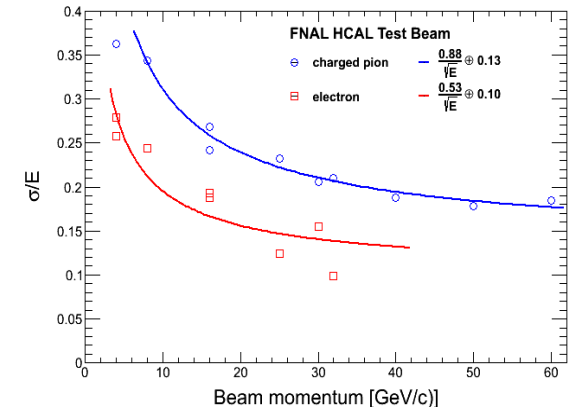
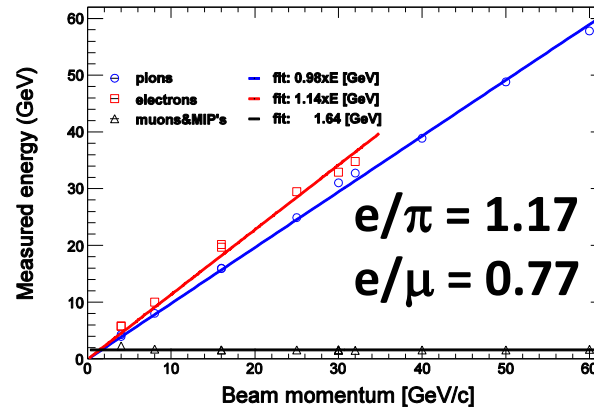


$[\Delta E]_{MPV} = 21.6 \pm 0.5$ photoelectrons and $\xi = 5.0 \pm 0.3$ photoelectrons



Test Beam: 2013 to 2016

2013



2016

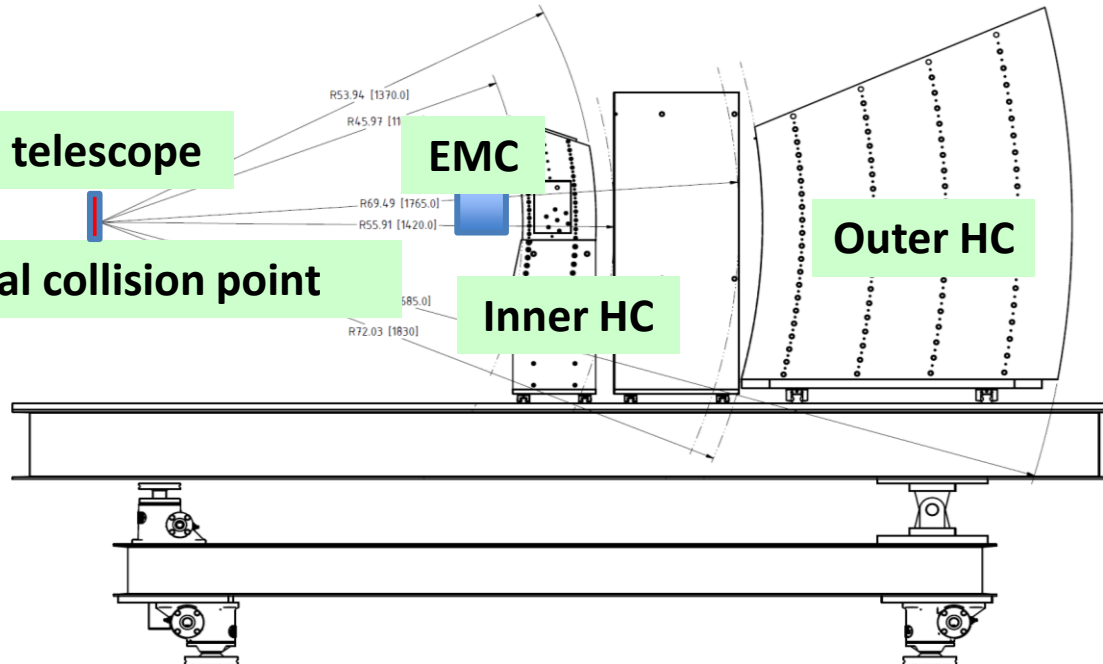
XY Si strip beam telescope

Virtual collision point

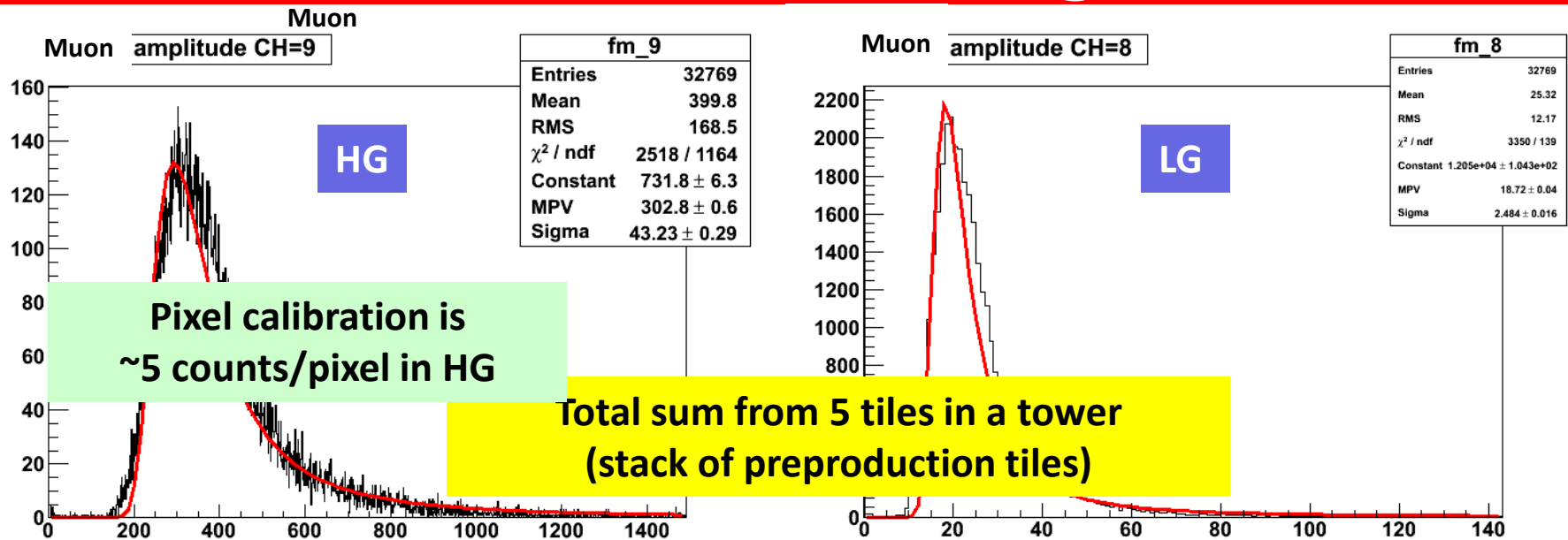
EMC

Inner HC

Outer HC



Test Beam 2016: Running Conditions



Muon crossing tower at 90deg	7 MeV
Sampling Fraction	3%
Visible energy	~230 MeV
Test Bench Least Count (High/Low Gains)	0.8/12.3 MeV/ADC count
Dynamic Range (1V unipolar pulse)	1.6GeV / 26GeV

Test Bench Measurements with Cosmic muons in Pseudo-tower of 5 tiles with SiPM's ganged to the common sPHENIX preamplifier

sPHENIX HCal Prototype today



Summary

- Since 2012 sPHENIX HCal matured from “Interesting concept” into well understood and system test ready detector. The Test Beam Run of 2013 was a major milestone in this process;
- By the time of this review we completed R&D program in scintillation tile development. Measurements at INR (Troitzk), DESY(LAr1-ND TPC), Colorado&BNL (sPHENIX) and at UNIPLAST provided consistent performance picture adequate to sPHENIX requirements;
- To mitigate the effects of sampling fraction variations in HCal we developed and are now ready to test two complementary approaches: by patterning reflective coating and/or by improving shower depth measurements using “effective” longitudinal segmentation in calorimeter with overlapping towers;
- We understand that success of the Project strongly depends on ability of a single supplier of tiles (UNIPLAST, Russia) to deliver. Until now UNIPLAST was extremely accommodating and delivered tiles on time and ready for installation. As a backup against “force major” kind of intervention on part of “almighties” sPHENIX may consider accelerated ordering of base material (shaped tiles with reflective coating) and development of a new tile finishing (grooving, fiber embedding and polishing, wrapping ...) facility at one of the sPHENIX participating groups or in US industry. We already have
 - (1) UTFSM in Valparaiso, Chile (require some knowledge transfer from Uniplast) and
 - (2) “Precision plastic” on LIinterested to this solution.

The End